The Socio-Economic Impact of Dadin Kowa Dam on Its Neighbouring Environment

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Abstract- This research work sets out to examine the socio-economic impact of Dadin-kowa Dam on its neighboring environment. Specifically, the study investigates how the dam has brought about changes in the people's farming techniques, their standard of living and its potential contribution to the overall development of the area. The problem hinges on how the dam has triggered changes in farming techniques in the area. The proposed hypothesis (Ho) that: there is no relationship between Dadin-kowa Dam and socio-economic activities taken place around the dam site, (Hi) that: there is relationship between Dadin-kowa Dam and socio-economic activities taking place around the dam site before and after the Dam construction in Yamaltu Deba Local Government Area, are tested. The result of the hypothesis testing is that there is a significant relationship between Dadin-kowa Dam and socio-economic activities around the dam site. Therefore, it is concluded that the socio-economic activities of people around the dam site are strongly influenced by the dam.

Indexed Terms- Dam, Socio-Economic impact, Socio-Economic Activities, Farming Techniques

I. INTRODUCTION

In every society whether rural or urban there is dominant economic activity engaged by large number of population of that society. This research focuses on Dadin-kowa Dam and its socio-economic impacts on the people living around the dam site. As pointed out by Abdulkadir (2021) a dam is a barrier that impounds water or underground streams to confine and utilize the flow of water for human purposes. In Lawson (2020) Resources behind dams are man-made water bodies which are important for water resources development programmes.

Dams are built for single or multiple uses. Single use dams are constructed for single purpose like hydroelectric power generation. Multiple or multipurpose dams are constructed to supply water for diverse uses such as water supply for municipal and industrial uses, livestock and fishing production etc. (Norman 2021). Construction of dams are considered one of the important capital projects, which is strategic for sustainable economic growth and development as dams serve as major sources of water for irrigation, hydroelectric power, household and industrial uses, to mention only a few. In view of growing population, increasing economic activities and non-sustainable irrigation systems lead to corresponding increase in human demands for water and energy, to which dams remain important means to meet such demands (Yusuf 2014). In Nigeria most of our dams are multipurpose dams, such as Kainji dam in Niger state, which was built in 1968; Tiga dam in Kano state; Bakalori dam in Zamfara state; Goronyo dam Sokoto state; and Dadin-kowa Dam in Gombe state (Norman 2021). At present, there are almost 50,000 large dams in use worldwide. The United States has the second largest number of dams in the world at 5,500, and China has the most with a whopping 19,000. The United States has 50 major dams – the most in the world. But before we had the Hoover Dam or any of the other major dams of today, our ancestors had to learn about dam engineering, and some of that was done through trial and error (Tata & Howard, 2021).

The construction of dams is considered as one of the most effective means of solving human problems of water shortage in sub-humid and arid areas. Olofin (2012) asserts that in Nigeria, dams' construction is seen as the only solution to the problem of water scarcity in savannah areas. Jesse (2019), states that dams bring social and economic changes to the regions, where they are located. Also Saidu (2019), shows that the creation of large reservoirs inevitably brings a host of changes such as agricultural innovation in form of irrigation, improved fishing,

infrastructure facilities, electricity and pipe borne water.

It also brings about some negative socio-economic consequences, like inundation of farms by water, reduction in fishing activities increased health hazard especially those associated resettlement or displacement and relocation of the affected population. It is common knowledge that Dadin Kowa dam was conceived and constructed by Federal government of Nigeria for hydroelectric power generation. Nonetheless, the dam is the major source of water for drinking, irrigation, in Gombe town, Gombe State. However, despite those problems, Dadin-kowa Dam like all other dams constructed both within and outside Nigeria has contributed to the improvement of living conditions of people living around dam site. In 2012, about 26,000 people were displaced by Dadin-kowa Dam due to over flooding and have affected the land use activities of the area. Even though natural disasters cannot be prevented but it can be predicted with adequate information so that destruction of lives and properties can be avoided. More so, many dams were constructed in Nigeria without carrying out feasibility study to ascertain whether or not benefits outweigh the costs. The aim of this research is to assess the impacts of Dadin-kowaDam on socio-economic activities of people living around dam site and will be achieved by identifying some forms of human activities around dam site, to identify the significance of human activities on the people living along the dam site and also examine some environmental problems around Dadinkowa Dam site (Wolman 2021)

II. MATERIALS AND METHOD

• Study Area
Dadin kowa village is located approximately about 35km away from Gombe State capital, at East of Gombe town between latitude 10° 19' N and 11° 32' N and Longitude 11° 48' E and 11° 54' E. Dadin kowa area is situated in Yamaltu Deba local government and is surrounded by Gulani, Maleri, Jurara, Wuyo, Deba and Kafarati towns (Timawus, 2010).
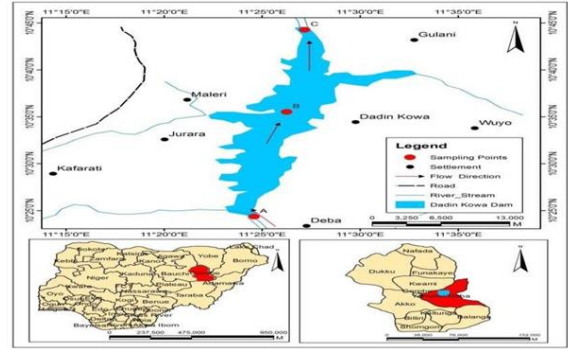

Figure1: Map of Nigeria showing DadiGnkowa area, Yamaltu_Deba LGA of Gombe state. Source: (Ministry of Lands and survey, Gombe state).

III. DATA PRESENTATION AND ANALYSIS

• Descriptive Analysis
Descriptive statistical tools like simple percentage and frequency tables vis-a'-viz charts were used here. The data presented in this chapter is a reflection of the feelings of the respondents.

Table 4.1: Types of Crops Cultivated Before and After the Dam Construction

Crops cultivated	Before dam (%)	After the dam (%)	(%) change
Rice	5	0	0
Wheat	-	0	0
Millet	100	63	-35
Fodder crops	-	5	+5
Maize	75	60	-15
Guinea corn	100	60	-40
Vegetables	30	50	+40
Groundnuts	60	55	-5
Beans	40	30	-10

Source: Field survey, 2021.

Table 4.1 shows the type of crops cultivated in the area before and after the dam construction which have changed overtime. While there has been some decrease in the cultivation of crops such as Maize, Millet, Guinea corn, Groundnuts and Beans as depicted in the table; cultivation of fodder crops and vegetables have rather increased.

However, as some have depreciated some have increased in yields and production such as vegetables i.e. tomatoes, and pepper in particular. Rice and Wheat in particular following the construction of the Dam have increased immensely. Rice by 15% and Wheat by 17% respectively. This is as a result of the use of irrigation farming system, which has improved the production of vegetables in the area.

Table 4.2: Farm Holding and Sizes before and After the Dam Construction

Farm size (ha)	Before the dam		After the dam	
	Frequency	Percentage	Frequency	Percentage
0-0.9	3	7.5	5	13.0
1-1.9	5	12.5	10	25.0
2-2.9	8	20.0	15	37.0
3-3.9	3	7.5	6	15.0
4-4.9	12	30.5	3	7.5
5 and above	9	22.5	1	2.5
Total	40	100	40	100

Source: Field survey, 2021
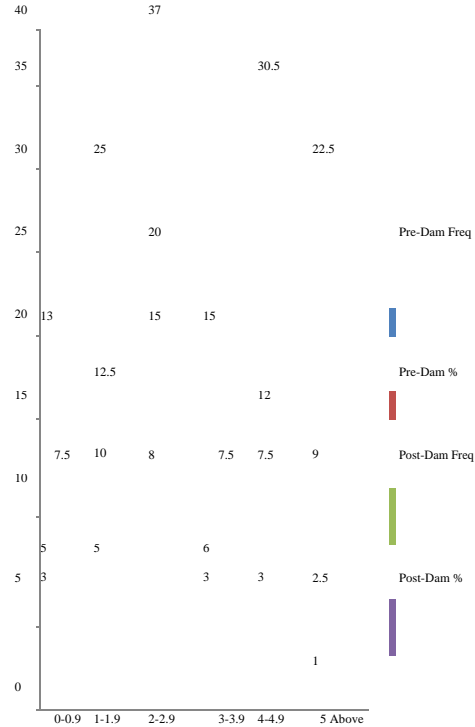
Table 4.3: Occupational characteristics of the constructions of the dam

Occupation	Before the dam		After the dam	
	Frequency	Percentage	Frequency	Percentage
Farming	90	45	85	42.5
Tailoring	19	9.5	19	9.5
Butchering	65	32.5	65	32.5
Black smiting	11	5.5	16	8
Bicycle repairing	5	2.5	5	2.5
Cake making	5	2.5	5	2.5
Middle men	5	2.5	5	2.5

Total	200	100	200	100

Source: Field survey, 2021

It is expected that whenever a project is introduced into an area the income of the people living around the dam site should also change either in positive or negative form. This is true with the construction of Dadin-kowa Dam. Before the construction of the dam, people are engaged into activities such as trading, tailoring and mat making and the likes. But with the construction of the dam substantial number of the population now depends solely on agricultural practices to earn their living and the income has increased too.

Research conducted has shown that a farmer earned about (937.00 Naira) per farm input before construction of the dam. However, since the construction of the dam, the average annual incomes of the farmers have risen by about 25%. The table above explains the occupational changes before and after the establishment of the project, and the table 4.4 below illustrates the amount changes before and after the Dam construction.

Table 4.4: Amount Earned by Farmers before and After the Dam Construction

Crop Type	Amoun tearned before the Dam	Amount earned after the dam	(%) change
Rice	12,500	15,800	3.8%
Wheat	10,000	12,700	2.2%
Maize	10,300	15,500	5.2%

Source: Field Survey, 2021.

Dadin Kowa Dam plays an important role in the life of especially dwellers of the surrounding communities and farmers as well. The table 4.5 below show the major uses of the Dam.

Table 4.5: The Major Uses of the Dam

| Types of uses	No of respondents	Percentage
Irrigation farming	129	40%
Fishing	81	25%
Tourism	16	5%
Recreational center	32	10%
Live stock production	64	20%
Total	322	100%

Table 4.6 shows that 25% of the population practice fishing. Although an important component of the Dam project is fisheries development. The water surface at dead storage level was planned to be 50 hectares, which was expected to support about 2 tonnes of fish harvest per reservoir per annum, giving a total of 1,000 tonnes of fish annually. Even if this target has not been realized changes have occurred in the system of fishing production. From the discussions held some of the fishermen, fishing in the reservoir is now their secondary occupation after farming. The number of people who take fishing as a full time has increased after the dam construction. Fishermen population as at 2010 in the area was over 1000 (Gongola River Basin Development authority, 2010), but now they have increased in number due to the development of fishing in the areas.The Dadin-kowa Dam reservoirs provided very important fish species which are marketed and consumed beyond the state in places such as Kaduna, Kano, and even Niger Republic and this has transformed the socio-economic of the area. Table 4.5 above has also shown that both tourism 5% and recreational centre 10% takes place around Dadin-kowa Dam site. Though some people do swimming in the reservoir whereas during festivals for example Sallah celebration and wedding ceremony some people around Gombe, Hinna and Deba use to visit the dam for their picnic

Table 4.6: Potentials of the Dam to the Socio-Economic Development of the Area

Farm size (ha)	Pre-dam unit		Post-dam unit	
	Per (ha)	Total ₦) (	Per (ha)	Total ₦) (
4	937	3,748	1,479	5,915
5	637	3,170	1,065	5,325
6	634	3,170	1,001	5,005
7	547	3,282	853	5,118

Source: Gongola River Basin Development Authority Report on Dadin-kowa Dam, 2010.

Figure 4.1.5: Potentials of the Dam to the Socio-Economic Development of the Area
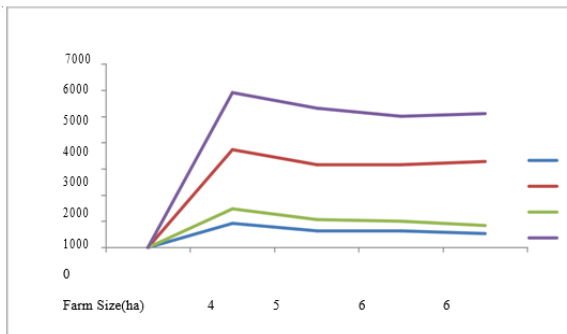
Source: Field Survey, 2021.

From Table 4.1.5, it can be deduced that since the construction of the dam the average annual income of the kbfarmers has risen by 25% and this has reflected in their standard of living and the farmers are able to save some part of their income that accrue to them from farming activities.

Table 4.7 Changes in the Farming Inputs

Input	Pre-Dam	Post-Dam
Animal manure	200 sacks	46 sacks
Chemical fertilizer	2,300 sack	25,334 sacks
Irrigation pumps	0	500
Cattle plough	30	5
Improved seed	0	609. 23 tonnes

Source: Gongola River Basin Development Authority Report on Dadinkowa Dam, 2010.

able 4.7 show that, the level of agricultural production depends mainly on the farm inputs. The use of various farm inputs has increased tremendously, these inputs include chemical fertilizers, cattle plough, insecticides, irrigation, pump etc. before the construction of the dam, people living around the dam site depends on local farm inputs as local seeds varieties use of old farming techniques and animal manure. However, with the construction of the dam the use of these local farm inputs some of these changes are illustrated the table above.

In Garhi, Kafarati and Jurara areas these is increase in the use of chemical fertilizers instead of local manures. Also, cattle ploughs have given way to the use of more agricultural machinery like tractors, irrigation pump what responsible for the new turn in farm is attributed to increase income of individual farmers. It also came as a result of the realization of higher output the need to feed growing population and higher market price. In early stage of the project, wheat seed of about 25 tonnes were provided to the farmers price and onion seeds were also sold at low prices RBDA, 2021.

Table 4.8: Problem Arising Due to Establishment of Dam

Type of problem	Not of respondent	Percentage
Erosion	64	20%
Flooding	129	40%
Diseases outbreak	129	40%

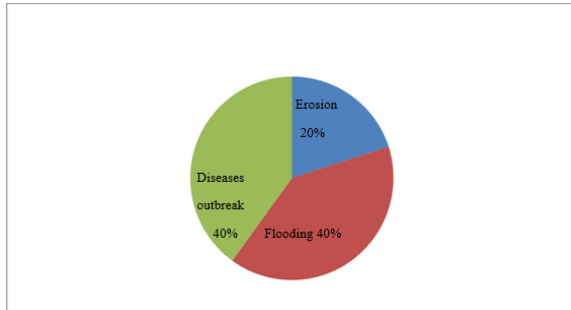| Total	322	100%

Fieldwork (2021)

Figure 4.7: Percentage of Problems Arising due to Establishment of Dam

Source: Field survey, 2021

Table 4.2.1: Changes in the Farming Inputs

	Pre-Dam		Post-Dam	
Inputs	Quantity	Frequency	Quantity	Frequency
Animal manure	200 sack	182	46 Sacks	273
Chemical fertilizers	2,300 sacks	191	25,334 Sacks	306
Irrigation pumps	0	204	500	294
Cattle plough	30	213	5	323
Improved seeds	0	217	609.23 tonnes	289

Source: Fieldwork 2021

Table 4.2.2: Chi-square for the Hypothesis

O	E	(O-E)	$(O-E)^2$	$\frac{(O-E)^2}{E}$
182	160.6	21.4	457.96	2.85
191	160.6	30.4	924.16	5.75
204	160.6	43.4	1,883.56	11.73
213	160.6	52.4	2,745.76	17.20
217	160.6	56.4	3,180.96	19.81
273		-24	576	
306	297			1.94
294	297	9	81	0.27
	297	-3	9	0.01
323	297	26	676	2.28
289	297	-8	64	0.22
Total				=62.06

Df=(10-1)(2-1)=9
9 under 0.05 (from the table of chi-square) =16.919
Chi-square calculated = 62.06
Chi-square tabulated = 16.92

DISCUSSION

Since chi-square calculated is greater than the chi-square tabulated therefore the null hypothesis is rejected at 5 percent level of significance that is there is no significant relationship between Dadin-kowa Dam and socio-economic activities taken place around the dam site. In other words, the Chi-squared results show that there is significant association between observed and expected frequencies implying that the construction of Dadin-kowa Dam is significantly associated with socioeconomic activities around the dam site. This is evident in table 4.2. and the results would have been more significant if tractors were included in the table, which is known to be one of the important sophisticated implements used for agricultural practices.

CONCLUSION AND RECOMMENDATIONS

- Summary

It was found that, agriculture, both subsistence and commercial (especially irrigation) is the most important and practicing activity typical of the people living around Dadin Kowa Dam. Five activities were identified, these include fishing, tailoring, wood-carving, blacksmithing and poultry.

The socio-economic impacts of Dadin Kowa Dam on the activities of the people living around the Dam was identified through this study to be highly economical. The Dam since its inception in 1984 has been the major source of drinking water for the town in one hand and also the source of water for fishing and irrigation in the other hand.

The research identified that, the construction of the dam has posed some serious adversities on the people around the dam site. These effects include the increased erosion 20% and soil degradation. After the dam some farmers experienced flooding with over 40% in their farms as well as gully erosion. Another negative impact felt by the people of these areas is the water-borne diseases outbreak 40%. These disease include river blindness, guinea worm infestation, cholera, malaria which were not known in the area prior to the Dam construction and people around the Dam site find it very difficult to curve such diseases.

• Conclusion

In line with the findings presented above, Dadinkowa Dam was built to boost food production and water supply. It has both negative and positive impacts on the place itself and the people living around it. It has change the pattern of activities in the area, and the change has affected the agricultural practices and productivity. These effects can be seen in the changes of farm sizes, farming system or cropping patterns, farming inputs and fishing activities as described above. Negatively, the Dam resulted in flooding, erosion, land degradation and some diseases such as Malaria, river-blindness, cholera and guinea-worm infestation which were not known in the community prior to the construction of the Dam.

• Recommendation

Following the identification of the economic activities of the people of Dadin Kowa community, government should provide modern farm machineries to boost the agricultural production in the community and should also build or construct a farm produce storage to enable proper maintenance and preservation of the farm produce.

However, in order to prevent and overcome such negative impacts of the Dam as erosion and land degradation as inflicted by the Dam, more trees should be planted and deforestation should be avoided. This would prevent the aforementioned menace and also enhance the fertility of the soil within the community. Furthermore, to curve and prevent the spread of such diseases as Malaria, Guinea-Worm infestation and River-blindness, the Dam should be properly chemicalised in such a way that the consumption of the water would not result in any sickness. In addition

to that, the Dam should be properly maintained by mending the leaking or bleeding parts, this is in a bid to prevent mosquitoes from gathering around the community transmitting diseases such as Malaria as already mentioned. Along this line, hospital should be built in the community to provide a health access to the target audience or people living in the site of the Dam, as to giving an aid or a therapy to those who have already fallen victims.

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